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(54) **Device for loading plastic sheet material into the mold of a molding press**

Vorrichtung zum Beladen von Kunststoffplatten in die Form einer Formpresse

Dispositif pour le chargement de feuilles en plastique dans le moule d'une presse de moulage

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**EP-A- 0 282 700** **FR-A- 2 637 835**  
**GB-A- 1 135 430** **US-A- 4 015 872**

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## Description

The present invention relates to a device for loading plastic sheet material into the mold of a molding press.

A common practice nowadays in the vehicle body component industry is to mold parts from plastic sheet material, such as heat-setting fiberglass-reinforced polyester resin known as SMC, which is usually supplied in rolls.

For each production part, the press is loaded with a number of sheets cut off the roll, and the size of which must correspond accurately to the part being produced.

Normally, each load consists of at least two sheets, which must be loaded in a predetermined mutual position on a conveyor, from which they are subsequently transferred to the mold.

On known molding systems, the load is usually transferred using hand-operated fixtures, so that accurate positioning of the load inside the mold is not only time-consuming but also dangerous in terms of the safety of the operator.

It is known from the document FR-A-2 637 835 a production line for shaping plastic sheet material, comprising a device for loading a load of the plastic material from a loading station into the mold. Therein, the load fed to the loading station is firstly compressed and then is punched by a set of horizontally-movable bars, which finally transfer the load into the mold.

It is an object of the present invention to provide an efficient, reliable device for loading plastic material into the mold of a molding press, designed to overcome the aforementioned drawbacks.

According to the present invention, there is provided a device for loading plastic sheet material into the mold of a molding press, said device comprising a conveyor for feeding a load of said plastic material into a loading station adjacent to said mold, transfer means being provided for transferring said load from said loading station into said mold; characterised by the fact that said conveyor comprises a number of spaced, parallel, horizontally-movable transport elements; a number of lifting elements being provided in said loading station and being vertically-mobile in the gaps between said transportation elements for removing said load off said transportation elements and leaving said load so removed on said transfer means.

A preferred, non limiting embodiment of the present invention will be described by way of example with reference to the accompanying drawings, in which:

Fig.1 shows a schematic plan view of a molding system comprising a loading device in accordance with the present invention;

Fig.2 shows a part view in perspective of the loading device;

Fig.3 shows a further part view in perspective of the loading device in a different operating position;

Fig.4 shows a larger-scale partial plan view of the

loading device;

Fig.5 shows a section along line V-V in Fig.4, in the idle position;

Figs 6-9 show schematic views of the Fig.5 section in various operating positions;

Fig.10 shows a table of the operating stages of the device.

Number 12 in Fig.1 indicates an automatic vehicle body component manufacturing system comprising a loading station 13 equipped with a roll 14 of plastic strip material 16, e.g. fiberglass-reinforced polyester resin known as SMC. Strip 16 of SMC is supplied in two protective polyester films, which are removed in station 19.

System 12 also comprises a station 23 for cutting strip 16 into sheets 24 and 24' (Fig.2); a station 34 for weighing sheets 24 and 24'; and a device 26 for transferring sheets 24 and 24' on to a first conveyor belt 27, on which sheets 24 and 24' are loaded in a predetermined mutual position to form the load 25 of material required for a given production part. Conveyor 27 feeds load 25 on to a second conveyor belt 28 by which it is fed to a preheat station 29 where sheets 24 and 24' are heated, without being distorted, to a given temperature.

From preheat station 29, a third conveyor 30 feeds load 25 to a loading station 31 featuring a loading device 32, which includes conveyor 30, and is governed by a control unit for feeding load 25 into the mold 35 of a molding press 33.

According to the present invention, conveyor 30 comprises a number of parallel looped belts 36 (Fig.1) powered by pulleys 37 so as to transport load 25 in a horizontal direction, and each separated from the adjacent belt 36 by a gap 38.

Loading device 32 also comprises a number of lifting elements, each consisting of a vertical rod 39 fitted on the top end with a pad 41. Pads 41 and respective rods 39 are arranged in horizontal rows 42 and columns 43, each row 42 being located in a respective gap 38 between two adjacent belts 36, and columns 43 being separated by gaps 44 perpendicular to gaps 38.

Rods 39 are fitted to a common vertically-mobile base 46 operated, for example, by an actuator comprising a pinion 47 engaging a rack 48 secured to base 46. Base 46 is normally maintained in the lowered position shown in Figs 2 and 5, wherein pads 41 are positioned beneath the supporting surface of load 25. When base 46 is raised, as shown in Fig.3, pads 41 engage load 25 on belts 36, so as to lift it off the supporting surface.

Loading device 32 also comprises means for transferring load 25 from pads 41 to mold 35, said means comprising a number of retractable bars or fingers 49 (Fig.4) supported on a cross member 51 and normally positioned in a horizontal plane over belts 36. Bars 49 are positioned beneath pads 41, when these are raised as shown by the dotted line in Fig.5, and are aligned with gaps 44 of columns 43 of rods 39 (Fig.3).

Cross member 51 (Figs 4 and 5) is connected to

two horizontal rods 52 operated by respective pneumatic linear actuators 53 fitted to a frame 54 on the operating arm 56 of a robot. Arm 56 is moved in known manner from the withdrawn position shown in Fig.5, wherein cross member 51 is adjacent to belts 36, to the Fig.7 position wherein cross member 51 is adjacent to mold 35.

Frame 54 also comprises a cross member 57 fitted with two nut screws 58 cooperating with two screw portions 59 of two cylindrical bars 61 mounted for rotation on a cross member 62 for arresting the edge of the load consisting of sheets 24 and 24'. Cross member 62 presents a number of holes 63 in which bars 49 are guided in sliding manner. Cylindrical bars 61 are connected to each other by two pairs of bevel gears 64, 65 and a transverse shaft 66, and are rotated simultaneously by a handwheel 67.

Operation of loading device 32 will be described with the aid of the Fig.10 table.

When load 25 of sheets 24, 24' is positioned on belts 36 in station 31 (Fig.1) ready for transfer into mold 35, arm 56 is positioned as shown in Fig.5; bars 49 are withdrawn by actuators 53; pads 41 on base 46 are lowered as shown in Fig.2; and, by means of handwheel 67, stop cross member 62 is so positioned that, when arm 56 is set to the Fig.7-9 position, cross member 62 corresponds with the edge 68 of mold 35.

Fig.10 shows the various stages or operations in the actual transfer of load 25 into mold 35, which consist in a pickup operation 69 wherein pinion 47 (Fig.2) raises base 46 to position rods 39 and pads 41 as shown in Fig.3 and so raise load 25; an operation 71 wherein actuators 53 move cross member 51 towards belts 36, so as to insert bars 49 inside gaps 44 between columns 43 of rods 39; an operation 72 wherein pinion 47 (Fig.2) lowers base 46 together with pads 41, thus leaving load 25 resting on bars 49 as shown in Fig.6; an operation 73 wherein arm 56 is moved leftwards to bring frame 54 up to mold 35 as shown in Fig.7; and, finally, an operation 74 wherein actuators 53 withdraw bars 49 while cross member 62 remains stationary. When the edge of load 25 engages cross member 62, as shown in Fig.8, load 25 is arrested, and, as bars 49 are withdrawn by actuators 53, slides along bars 49 so as to drop down inside mold 35, as shown in Fig.9, at which point, arm 56 is restored to the Fig.5 position.

The advantages of the device according to the present invention will be clear from the foregoing description.

In particular, it provides for transferring load 25 fully automatically by means of robot arm 56, so that the operator need no longer work between the two halves of the mold on the press. Moreover, it provides for highly straightforward transfer of load 25 from belts 36 to retractable bars 49 and from these to mold 35, thus ensuring accurate positioning of load 25 and, consequently, consistent, good quality production parts.

To those skilled in the art it will be clear that

changes may be made to the method and equipment described and illustrated herein without, however, departing from the scope of the present invention. For example, changes may be made to the design of pads 41 or frame 54 supporting bars 49.

#### Claims

1. A device for loading plastic sheet material into the mold of a molding press, said device comprising a conveyor (30) for feeding a load (25) of said plastic material into a loading station (31) adjacent to said mold (35), transfer means (49, 62) being provided for transferring said load (25) from said loading station (31) into said mold (35); characterised by the fact that said conveyor (30) comprises a number of spaced, parallel, horizontally-movable transport elements (36); a number of lifting elements (39, 41) being provided in said loading station (31) and being vertically-mobile in the gaps (38) between said transportation elements (36) for removing said load (25) off said transportation elements (36) and leaving said load (35) so removed on said transfer means (39, 41).
2. A device as claimed in Claim 1, characterised by the fact that said transportation elements consists of parallel, simultaneously-moving looped belts (36); each gap (38) between said belts (36) housing a row (42) of said lifting elements (39, 41).
3. A device as claimed in Claim 2, characterised by the fact that each said lifting element (39, 41) comprises a pad (41) fitted to the top end of a vertical rod (39); said rods (39) being arranged in horizontal rows (42) and columns (43), and being supported on a common vertically-mobile base (46).
4. A device as claimed in Claim 3, characterised by the fact that said transfer means (49, 62) comprise a number of spaced, coplanar, horizontal bars (49) located over and perpendicular to the traveling direction of said belts (36), and insertable between said columns (43) of said rods (39).
5. A device as claimed in Claim 4, characterised by the fact that said transfer means (49, 62) also comprise stop means (62) for arresting said load (25), and which are so positionable as to transfer said load (25) into said mold (35) by displacing said bars (49) in relation to said stop means (62).
6. A device as claimed in Claim 5, characterised by the fact that said stop means comprise a cross member (62) with holes for guiding said bars (49) in sliding manner; said cross member (62) and said bars (49) being mounted on a frame (54) designed to move between a position adjacent to said belts

(36) and a position adjacent to said mold (35).

7. A device as claimed in Claim 6, characterised by the fact that said frame (54) is so moved by an operating member (56); said bars (49) being moved in relation to said cross member (62) by an actuating member (53).
8. A device as claimed in Claim 6 or 7, characterised by the fact that it comprises means (67) for moving said cross member (62) parallel to itself, and so regulating the position of said cross member (62) on said frame (54) according to the required position of said load (25) over said mold (35).

#### Patentansprüche

1. Vorrichtung zum Laden von Kunststoff-Folienmaterial in die Form einer Formpresse, welche Vorrichtung einen Förderer (30) zum Zuführen einer Masse (25) aus Kunststoffmaterial zu einer Ladestation (31) angrenzend an die Form (35), Überführungseinrichtungen (49,62) zur Überführung der Masse (25) von der Ladestation (31) in die Form umfaßt, dadurch **gekennzeichnet**, daß der Förderer (30) eine Anzahl von im Abstand liegenden, parallelen, waagerecht beweglichen Transportelementen (36) umfaßt, daß eine Anzahl von Hubelementen (39,41) in der Ladestation (31) und in den Zwischenräumen (38) zwischen den Transportelementen (36) vertikal zum Entfernen der Masse (25) von den Transportelementen (36) und zur Überführung der Masse (35) auf den Transfereinrichtungen (39,41) vorgesehen ist.
2. Vorrichtung nach Anspruch 1, dadurch **gekennzeichnet**, daß die Transportelemente aus parallelen, gleichzeitig bewegten, endlosen Bändern (36) bestehen, daß hier der Zwischenraum (38) zwischen den Bändern (36) eine Reihe (42) der Hubelement (39,41) aufnimmt.
3. Vorrichtung nach Anspruch 2, dadurch **gekennzeichnet**, daß die Hubelemente (39,41) eine Stützplatte (41) aufweisen, die am oberen Ende an der senkrechten Stange (39) angebracht ist, daß die Stangen (39) in waagerechten Reihen (42) und Spalten (43) angeordnet sind, und daß sie auf einer vertikalbeweglichen gemeinsamen Basis (46) angebracht sind.
4. Vorrichtung nach Anspruch 3, dadurch **gekennzeichnet**, daß die Überführungseinrichtungen (49,62) eine Anzahl von im Abstand liegenden, koplanaren, waagerechten Fingern (49) umfaßt, die senkrecht zu der Bewegungsrichtung der Bänder (36) und oberhalb der Bänder angeordnet sind und zwischen die Spalten (43) der Stangen (39) ein-

schiebbar sind.

5. Vorrichtung nach Anspruch 4, dadurch **gekennzeichnet**, daß die Überführungseinrichtungen (49,62) weiterhin Anschlagmittel (62) zum Festhalten der Masse (25) aufweisen, die so anzuordnen sind, daß die Masse (25) in die Form (35) durch Verschieben der Fingern (49) in bezug auf die Anschlagmittel (62) überführbar sind.
6. Vorrichtung nach Anspruch 5, dadurch **gekennzeichnet**, daß die Anschlagmittel ein Querglied (62) umfassen mit Bohrungen zum Führen der Finger (49) in gleitender Bewegung aufweisen, daß das Querglied (62) und die Finger (49) an einem Rahmen (54) angebracht sind, der zwischen einer Position angrenzend an die Bänder (36) und einer Position angrenzend an die Form (35) beweglich ist.
7. Vorrichtung nach Anspruch 6, dadurch **gekennzeichnet**, daß der Rahmen (54) durch einen Antrieb (56) beweglich ist, daß die Finger (49) in bezug auf das Querglied (62) durch einen Antrieb (53) bewegbar sind.
8. Vorrichtung nach Anspruch 6 oder 7, dadurch **gekennzeichnet**, daß diese Mittel (67) zum Bewegen des Quergliedes (62) parallel zu sich selbst und damit zur Einstellung der Position des Quergliedes (62) an dem Rahmen (54) entsprechend der erforderlichen Position der Masse (25) oberhalb der Form (35) aufweist.

#### Revendications

1. Dispositif pour le chargement d'une matière plastique sous forme de feuilles dans le moule d'une presse de moulage, ledit dispositif comprenant un convoyeur (30) pour amener une charge (25) de ladite matière plastique dans un poste de chargement (31) adjacent audit moule (35), des moyens de transfert (49,62) étant prévus pour transférer ladite charge (25) depuis ledit poste de chargement (31) dans ledit moule (35); caractérisé en ce que ledit convoyeur (30) comprend un nombre d'éléments espacés parallèles de transport (36) déplaçables horizontalement; un nombre d'éléments de soulèvement (39,41) étant prévu dans ledit poste de chargement (31) et étant déplaçable verticalement dans les intervalles (38) présents entre lesdits éléments de transport (36) pour retirer ladite charge (25) desdits éléments de transport (36) et abandonner ladite charge (25) ainsi retirée sur lesdits moyens de transfert (39,41).
2. Dispositif selon la revendication 1, caractérisé en ce que lesdits éléments de transport sont consti-

tués de courroies parallèles en bouche (36), qui se déplacent simultanément; chaque intervalle (38) situé entre lesdites courroies (36) logeant une rangée (42) desdits éléments de soulèvement (39,41).

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3. Dispositif selon la revendication 2, caractérisé en ce que chacun desdits éléments de soulèvement (39,41) comprend un patin (41) fixé à l'extrémité supérieure d'une tige verticale (39); lesdites tiges (39) étant disposées suivant des rangées horizontales (42) et des colonnes horizontales (43) et étant supportées sur une base commune (46) déplaçable verticalement. 10
  
4. Dispositif selon la revendication 3, caractérisé en ce que lesdits moyens de transfert (49,62) comprennent un nombre de barres horizontales espacées et coplanaires (49) situées au-dessus desdites courroies (36) et perpendiculairement à la direction de déplacement de ces dernières, et pouvant être insérées entre lesdites colonnes (43) desdites tiges (39). 15 20
  
5. Dispositif selon la revendication 4, caractérisé en ce que lesdits moyens de transfert (49,62) comprennent également des moyens d'arrêt (62) servant à arrêter ladite charge (25) et qui peuvent être positionnés de manière à transférer ladite charge (25) dans ledit moule (35) par déplacement desdites barres (49) par rapport auxdits moyens d'arrêt (62). 25 30
  
6. Dispositif selon la revendication 5, caractérisé en ce que lesdits moyens d'arrêt comprennent un élément transversal (62) comportant des trous pour guider lesdites barres (49) de manière qu'elles glissent, ledit élément transversal (62) et lesdites barres (49) étant montés sur un cadre (54) conçu de manière à se déplacer entre une position adjacente auxdites courroies (36) et une position adjacente audit moule (35). 35 40
  
7. Dispositif selon la revendication 6, caractérisé en ce que ledit cadre (54) est déplacé par un organe d'actionnement (56); lesdites barres (49) étant déplacées par rapport audit organe transversal (62) par un élément d'actionnement (53). 45
  
8. Dispositif selon la revendication 6 ou 7, caractérisé en ce qu'il comprend des moyens (67) pour déplacer ledit élément transversal (62) parallèlement à lui-même et régler ainsi la position dudit élément transversal (62) sur ledit cadre (54) conformément à la position requise de ladite charge (25) au-dessus dudit moule (35). 50 55

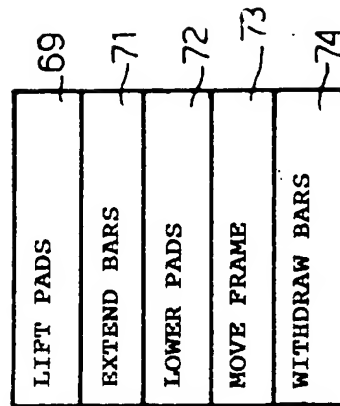
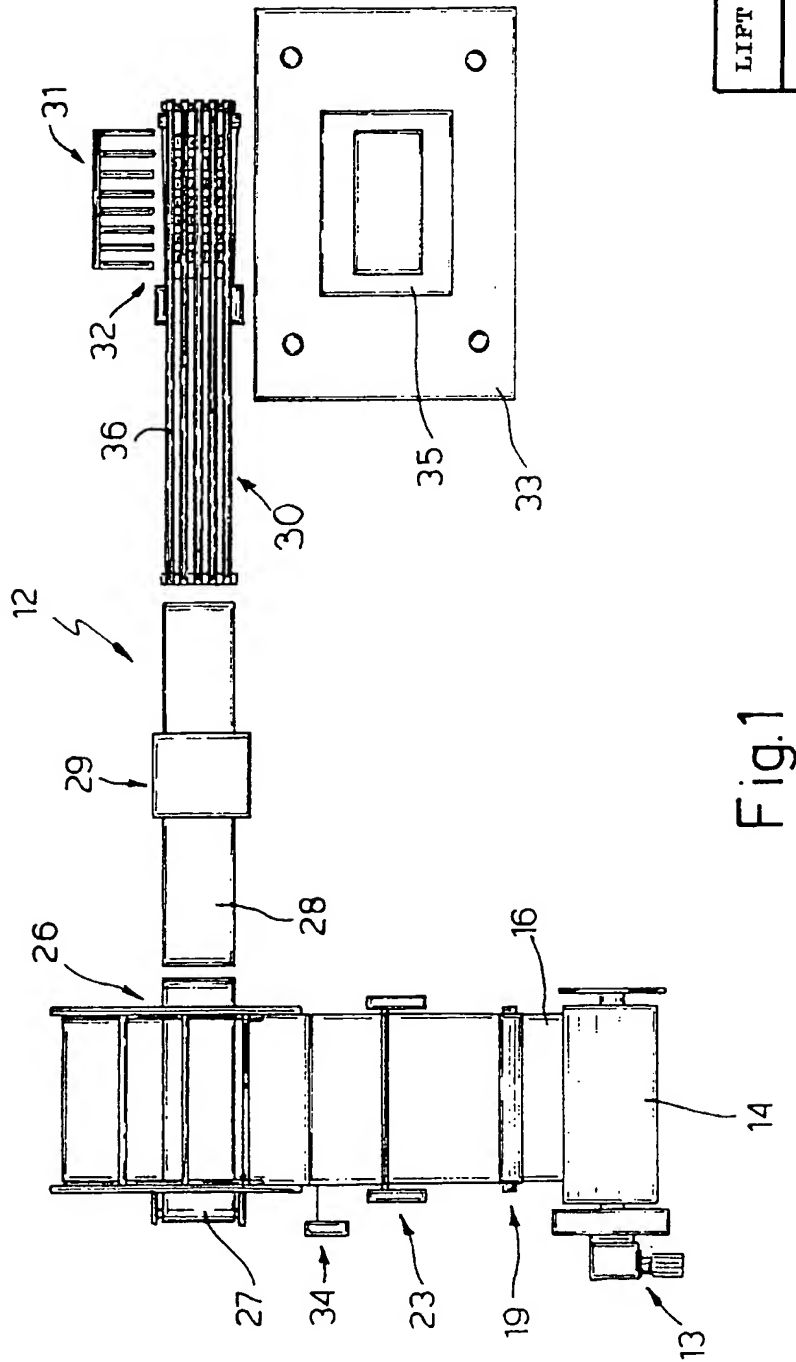


Fig 10

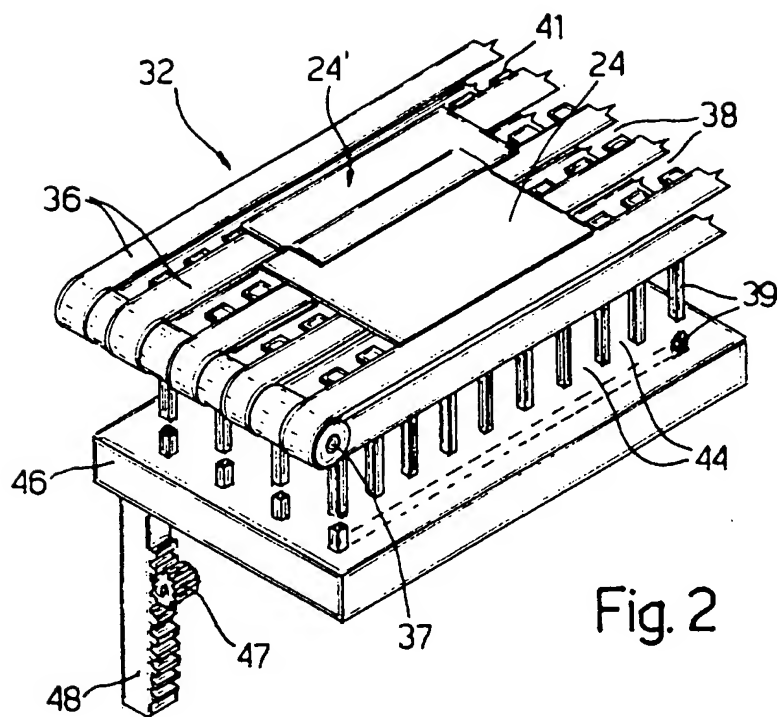


Fig. 2

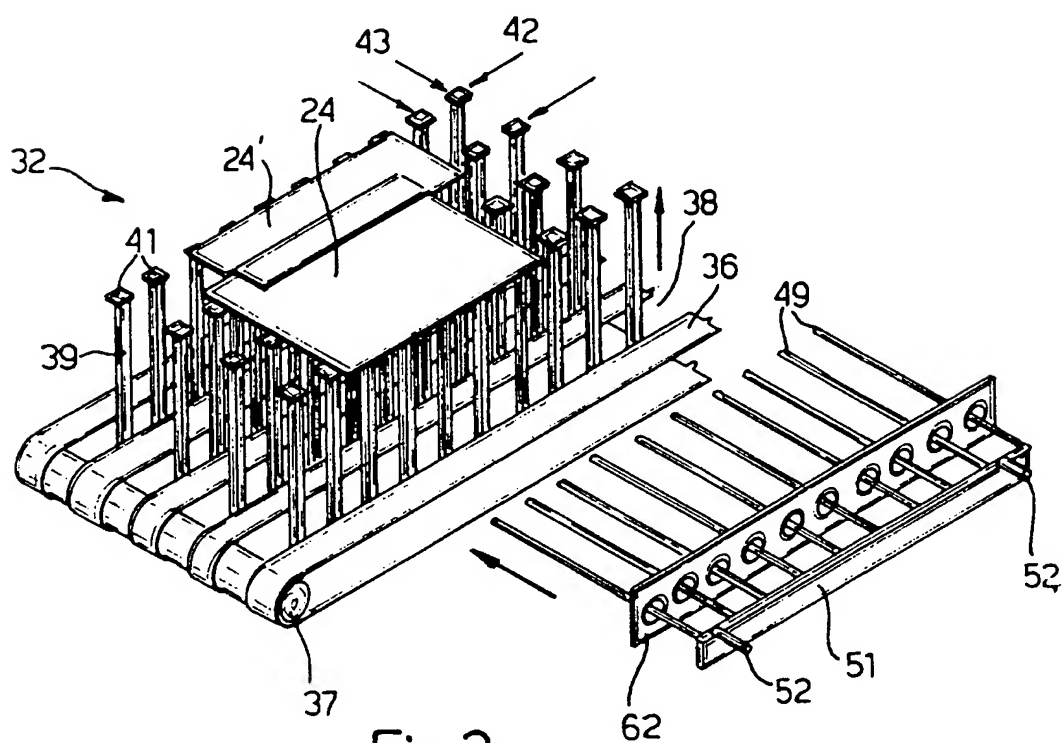


Fig. 3

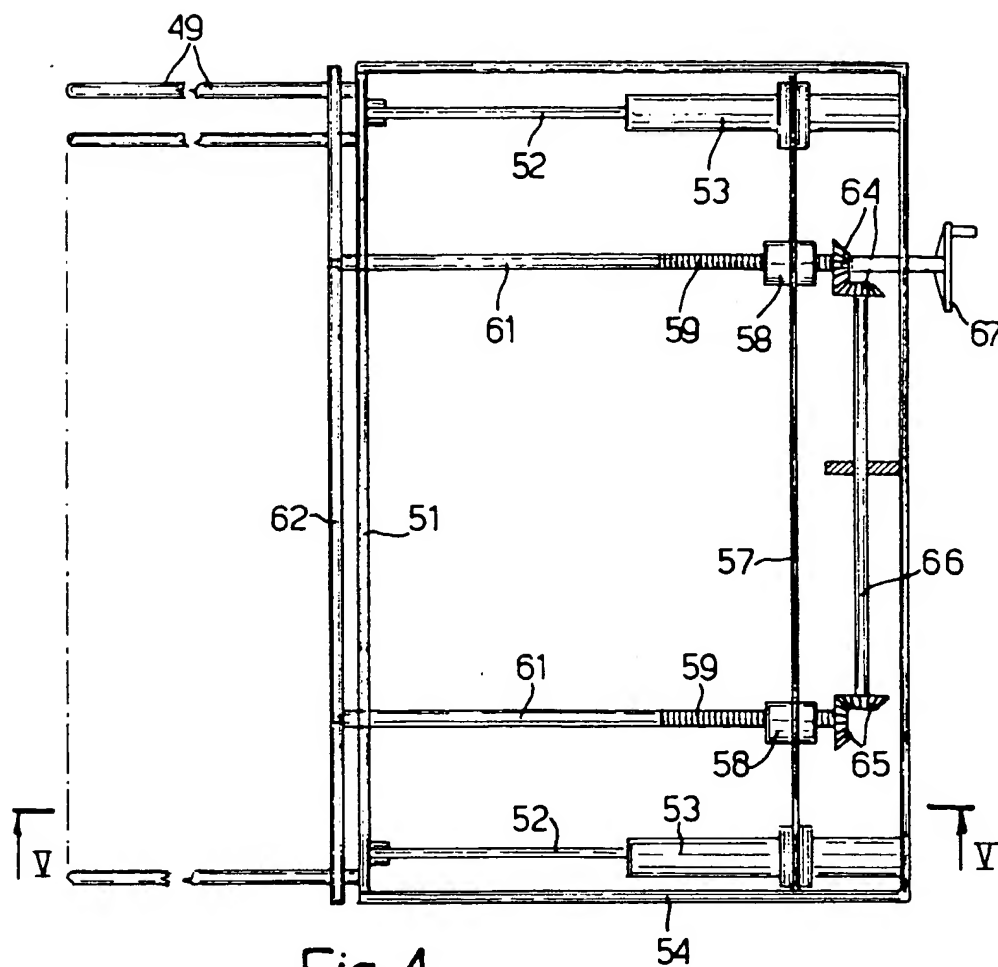


Fig. 4

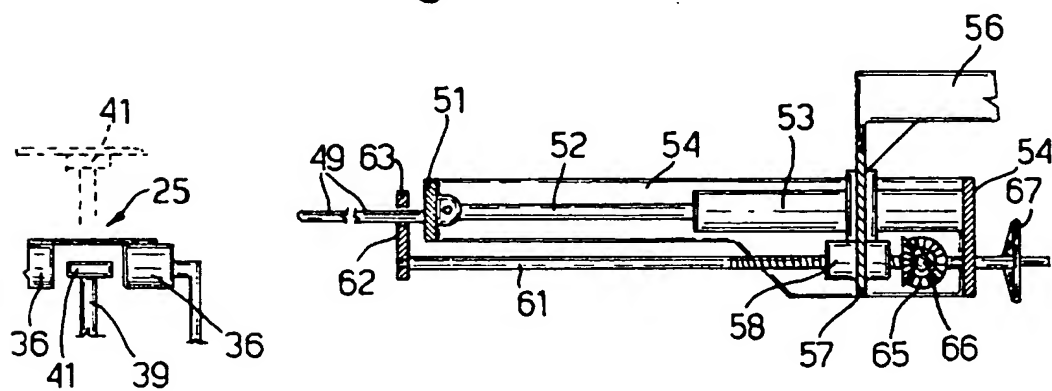


Fig 5

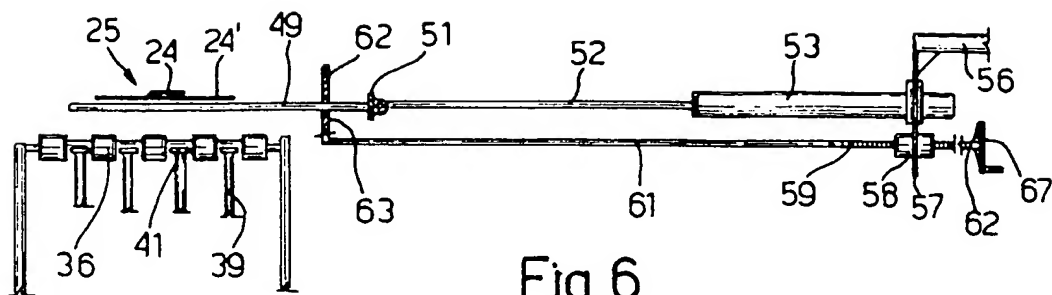


Fig. 6

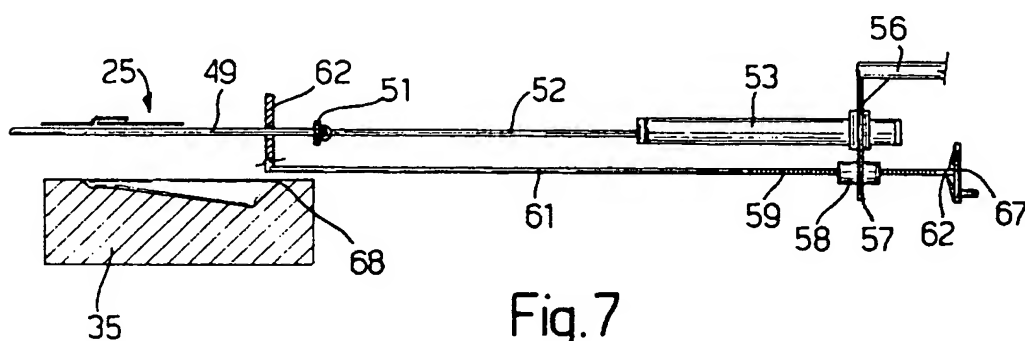


Fig. 7

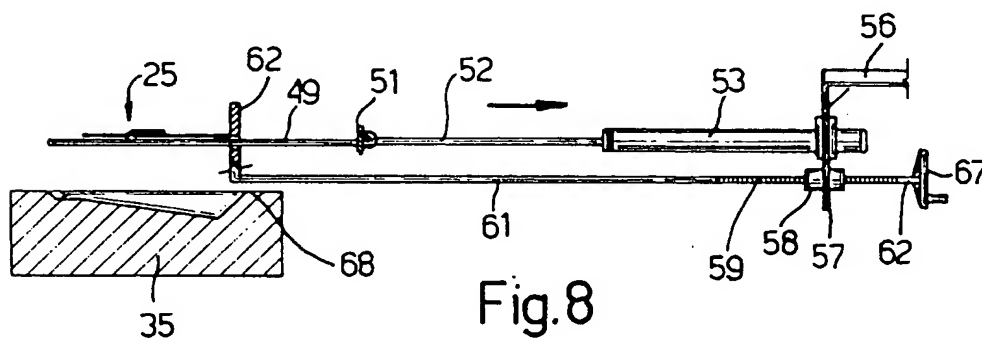


Fig. 8

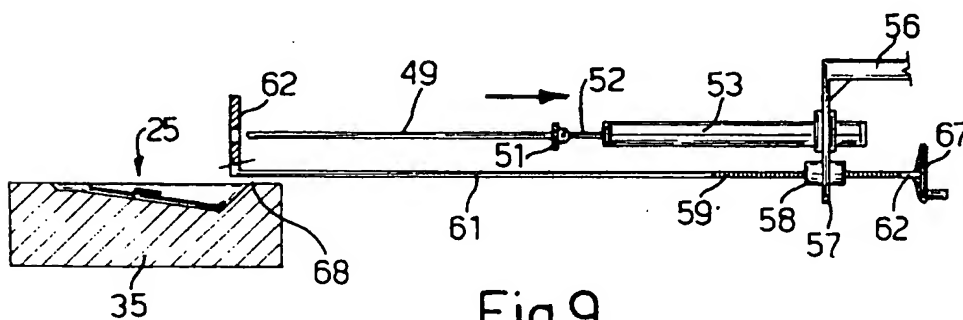


Fig. 9

L2 ANSWER 1 OF 1 WPINDEX COPYRIGHT 2003 THOMSON DERWENT on STN  
 AN 1990-342957 [46] WPINDEX  
 DNC C1990-148654  
 TI Mould loader for FRP moulding material - where mechanical system can pick up, convey and deposit in mould tacky laminar material and hence provide reproducible conditions.  
 DC A32  
 IN BRUSSEL, R  
 PA (FIBR-N) FIBRON GMBH; (KRPP) KRUPP MASCHINENTECHNIK GMBH; (KRPP) KRUPP MASCH TECH GM  
 CYC 5  
 PI EP 396941 A 19901114 (199046)\* <--  
     R: DE ES FR IT SE  
     DE 3915380 A 19901115 (199047)  
     EP 396941 A3 19920102 (199320) <--  
 ADT EP 396941 A EP 1990-107318 19900418; DE 3915380 A DE 1989-3915380 19890511; EP 396941 A3 EP 1990-107318 19900418  
 PRAI DE 1989-3915380 19890511  
 REP NoSR.Pub; 1.Jnl.Ref; DE 1225852; EP 282700; JP 57174205; US 4571320  
 IC B29C031-08; B29C043-34; B29C067-14  
 AB EP 396941 A UPAB: 19940223  
     A device for moving FRP moulding material, and particularly for placing tacky resinous materials into mould, has a carrying member which moves in both horizontal and vertical directions. This member is applied together with a stripper prong at the front of a swivelling frame which turns about a horizontal axis on a mounting which slides at least horizontally; the plane of the prongs of the stripper does not coincide with those of the carrying member; and the latter are withdrawn against the carrying direction behind the prongs of the stripper. All the prongs are preferably coated with PTFE.  
     ADVANTAGE - The device is not sensitive to contamination in use. It is suitable for picking up, conveying and accurately depositing tacky laminar pressing materials. It therefore provides reproducible conditions and a constant quality of mouldings. @ (8pp Dwg.No.0/3)  
     0/3  
 FS CPI  
 FA AB  
 MC CPI: A11-A; A11-B09C; A12-S08  
 PLC UPA 19930924